

33 74 511 Replacing bearing for gear set in housing (bevel gears removed)

Construction status retrofit

Spacing ring and steel wheel flange

NOTICE

After housing replacement and after repair, for example work on the gear set and bearings, the oil in the bevel gears has to be changed after approx. **1000 km**.

NOTICE

All bearings and seals affected by the repair work must be replaced.

Preparatory work

Removing cover for bevel-gear housing

Draining oil from bevel gears (bevel gears removed)

Positioning adapters in retaining fixture

Installing bevel gears in retaining fixture

Installing flange and locking device

Core activity

(-) Remove the nut from bevel pinion

- Block locking device (No. 33 2 503) so that it cannot turn in the release direction.

ATTENTION

Heating of bevel gear nut

Damage to radial shaft seal

- After the bevel gear nut has been slackened, the radial shaft seal of the bevel gear has to be renewed.

- Heat nut (1) and remove with socket wrench insert (No. 33 1 721).

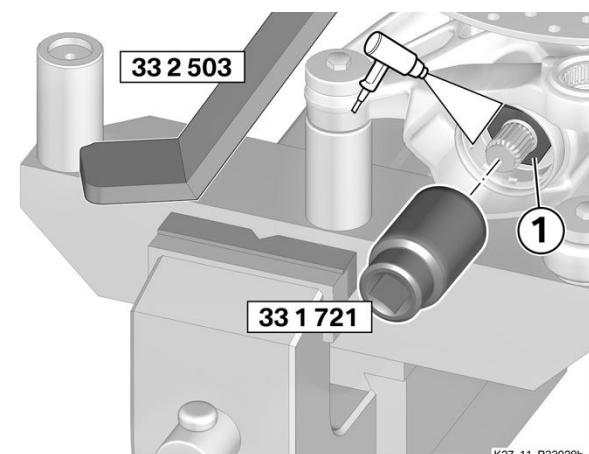


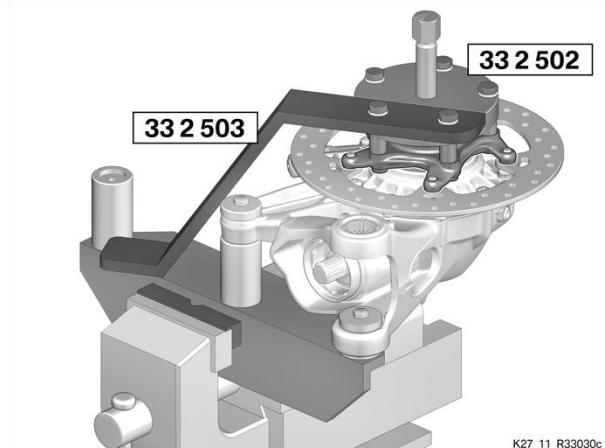
Release temperature, bevel-pinion nut	100 °C	
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- Clean the threads.

(-) Remove the flange and locking device

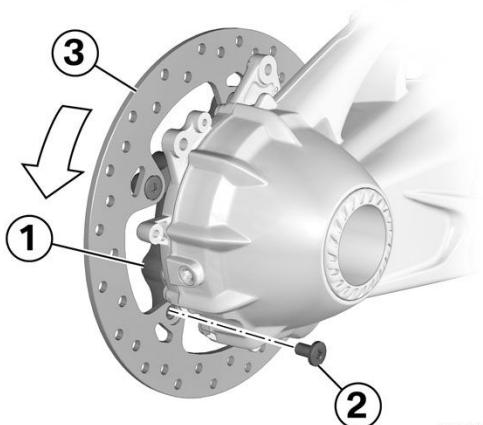
- Remove flange (No. 33 2 502) with locking device (No. 33 2 503).





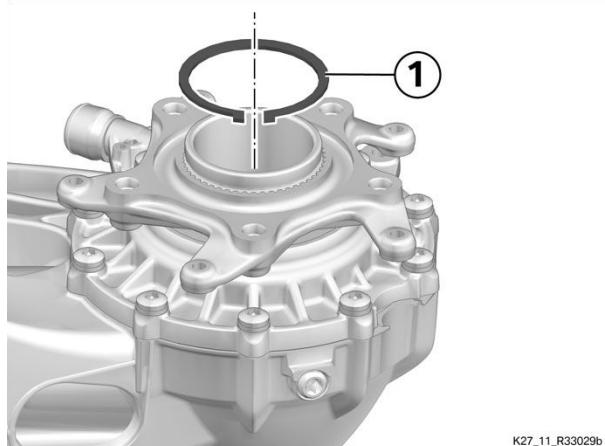
(-) Removing rear brake disc

- Turn wheel flange (1) until a screw (2) is accessible, lock the axle and remove screw (2).
- Repeat this procedure until all screws (2) have been removed.
- Remove brake disc (3)



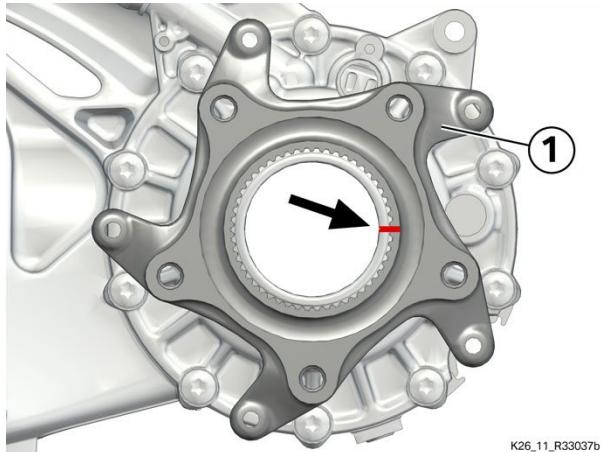
(-) Removing retainer for wheel flange

- Remove circlip (1).

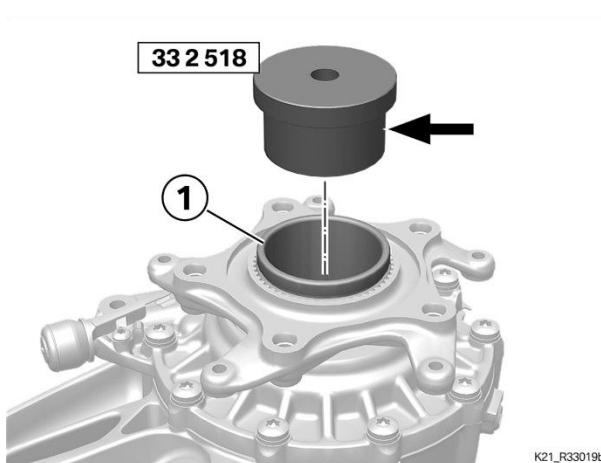


(-) Marking installed position of wheel flange

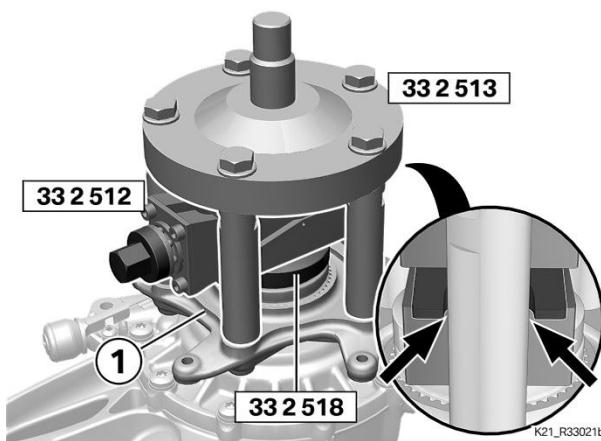
- Mark the installed position of wheel flange (1) in a way that is clearly visible (arrow).



(-) Removing wheel flange



- Insert plate (No. 33 2 518) in wheel axle (1).
- » Guide (arrow) is facing down.



- Position counter-holder (No. 33 2 513) on wheel flange (1) and tighten.
- Prepare puller (No. 33 2 512).

☞ NOTICE

Regularly lubricate the sliding surfaces of the puller with the grease provided with the tool.

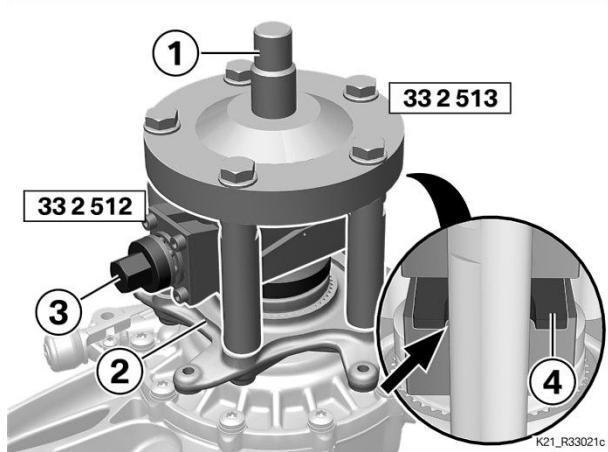
☞ ATTENTION

Inner wedge of puller slips forward during pull-off operation

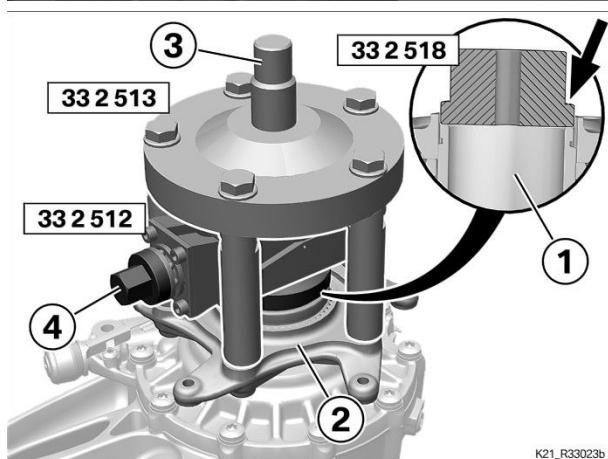
Damage to tool

- Centre the puller.
- Repeatedly check positioning.

- Make sure that puller (No. 33 2 512) is retracted and centre it (arrows) relative to counter support (No. 33 2 513) on plate (No. 33 2 518).
- Pretension spindle (1) on puller (No. 33 2 512).
- Ease off wheel flange (2) by turning spindle (3) until puller sled (4) and counter support (No. 33 2 513) **make contact** (arrow).
- Re-engage puller (No. 33 2 512) by retracting it fully, positioning it and again pretensioning it with spindle (1).



- Ease off wheel flange (2) by turning spindle (3) until wheel flange (2) is **in contact with** puller (No. 33 2 512).
- Back off puller (No. 33 2 512) and remove.



- Turn plate (No. 33 2 518) over and position it on wheel axle (1).
 - » The guide (arrow) is facing out.
- Check that puller (No. 33 2 512) is retracted and centre it on plate (No. 33 2 518).
- Pretension spindle (3) on puller (No. 33 2 512).
- Remove wheel flange (2) by turning spindle (4).
- Remove the special tools.

(-) Removing spacing ring for wheel flange

- Remove O-ring (1).
- Remove spacer (2).

(-) Removing housing cover for bevel gears

NOTICE

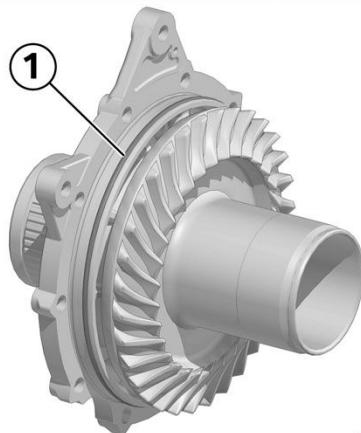
If the wheel axle is removed from the bevel-gear housing, install a new shaft sealing ring in the housing.

- Remove screws (1).
- Remove housing cover (2) and remove shims (3).

- Remove housing cover (2) with wheel axle.

(-) Removing O-ring from housing cover for bevel gears

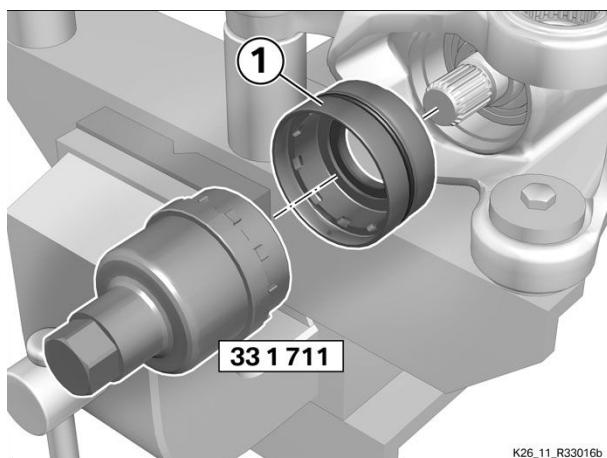
- Remove O-ring (1).



K25_HP_R33034c

(-) Removing threaded ring from bevel pinion

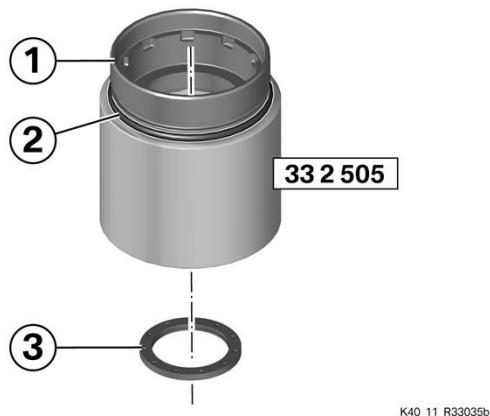
- Remove threaded ring (1) with pin wrench (No. 33 1 711).



K26_11_R33016b

(-) Disassembling threaded ring for bevel pinion

- Install threaded ring (1) in support (No. 33 2 505).
- Remove O-ring (2).
- Using a suitable tool, remove shaft sealing ring (3) from threaded ring (1).



(-) Removing bevel pinion from bevel-gear housing

- Install thread adapter (No. 33 2 541) and pull rod (No. 13 5 251) with impact weight (No. 13 5 253).
- Heat the housing around bearing inner race (1).

Technical data			
Release temperature for bevel pinion bearing		100 °C	

- Remove bearing race (1) with bevel pinion (2).
- Remove spacer (3).

(-) Removing bevel pinion needle roller bearing from bevel-gear housing

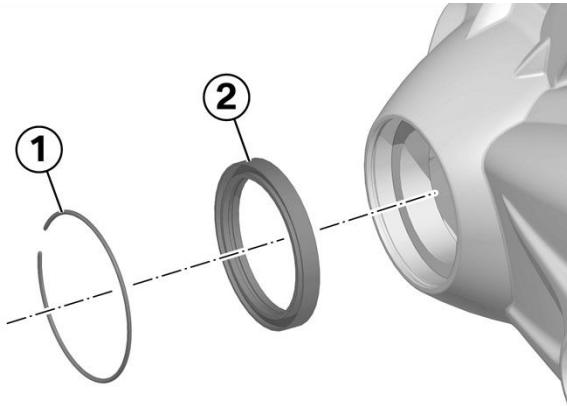
- Install pull rod (No. 13 5 251), impact weight (No. 13 5 253) and thrust piece (No. 33 2 524).
- Heat the housing around the bearing.

Technical data			
Release temperature for bevel pinion bearing		100 °C	

- Keep tension on pull rod (No. 13 5 251) and make sure that thrust piece (No. 33 2 524) is in line with the recess in the housing.
- Remove bearing by striking evenly with impact weight (No. 13 5 253).

(-) Removing shaft sealing ring of wheel axle from housing

- Remove circlip (1).
- Using a suitable tool, remove shaft sealing ring (2) from the rear.



K25_HP_R33017c

(-) Removing bearing of crown wheel from bevel-gear housing

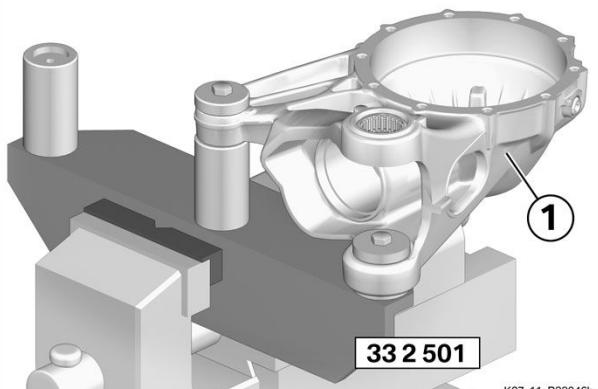
- Turn the retaining fixture with bevel-gear housing (1) and clamp it firmly in the vice.
- » Bevel-gear housing (1) is facing vertically down.
- Install pull rod (No. 13 5 251), impact weight (No. 13 5 253) and thrust piece (No. 33 2 521). Check that the thrust piece is correctly seated.
- Heat bevel-gear housing (1) around the bearing.

Technical data			
Release/mating temperature		100 °C	

- Remove the bearing.

(-) Removing housing from retaining fixture

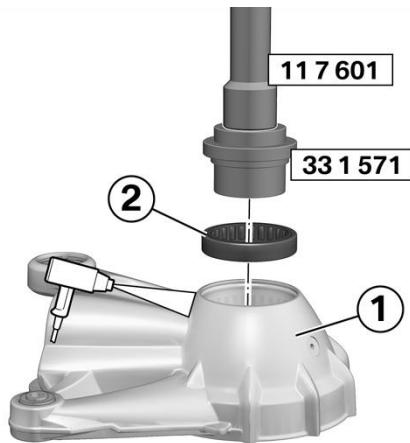
- Remove housing (1) from retaining fixture (No. 33 2 501).



K27_11_R33046b

(-) Installing bearing of crown wheel in bevel-gear housing

- Lay housing (1) flat on a suitable surface.
- Heat housing (1) around bore for bearing (2).



K27_11_R33047b

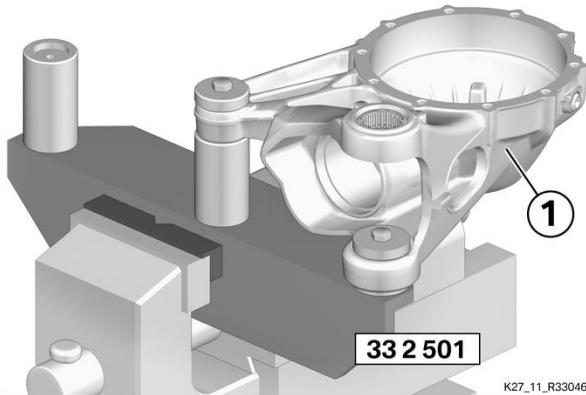
Technical data

Mating temperature, bearing of crown wheel	120 °C	
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- Position bearing (2) in housing (1) and using handle (No. 11 7 601) and drift (No. 33 1 571) **rapidly** press it in until seated.

(-) Installing housing in retaining fixture

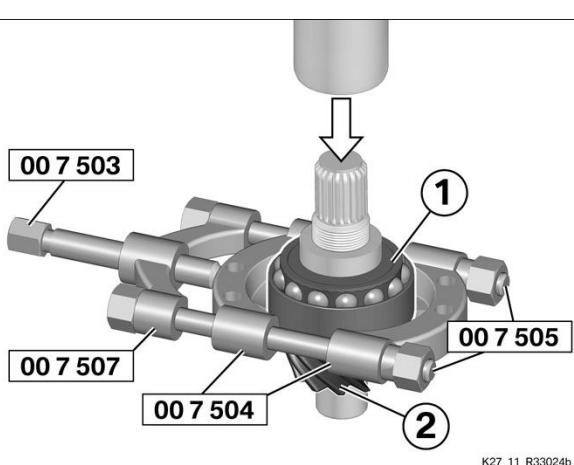
- Position housing (1) on retaining fixture (No. 33 2 501) and secure.



K27_11_R33046b

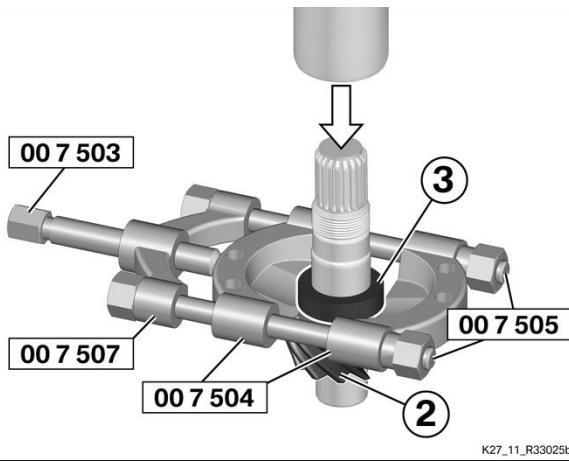
(-) Removing radial/thrust bearing of bevel pinion

- Install and slightly preload jaws (No. 00 7 504), adjusting screws (No. 00 7 505), yoke (No. 00 7 507) and thrust spindle (No. 00 7 503).
- Position the puller/separator on the press and remove bearing (1), counter-holding bevel pinion (2).



K27_11_R33024b

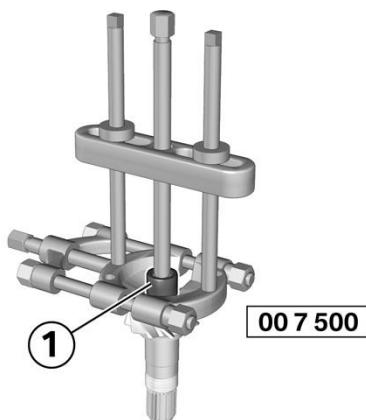
- Install and slightly preload jaws (No. 00 7 504), adjusting screws (No. 00 7 505), yoke (No. 00 7 507) and thrust spindle (No. 00 7 503).
- Position the puller/separator on the press and remove bearing inner race (3), counter-holding bevel pinion (2).



K27_11_R33025b

(-) Removing inner bearing race of needle roller bearing for bevel pinion

- Preassemble puller/separator (No. 00 7 501), (No. 00 7 502), (No. 00 7 503), (No. 00 7 504), (No. 00 7 505), (No. 00 7 507) and apply light preload.
- Heat inner bearing race (1) and remove.



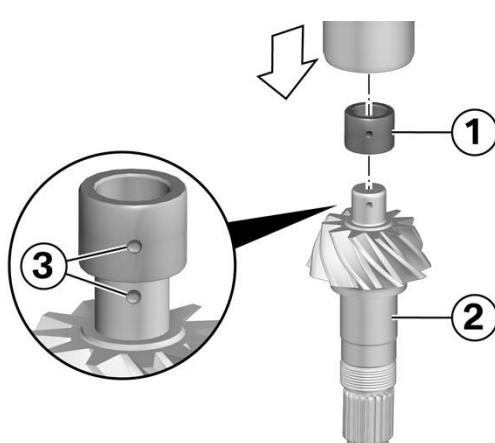
K43_11_R33015b

Technical data

Release temperature, inner race	100 °C	
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(-) Installing inner bearing race of needle roller bearing for bevel pinion

- Hold inner bearing race (1) in position on bevel pinion (2).
- » Oil bores (3) are in line with each other.
- Using a press, press in inner bearing race (1) until seated.



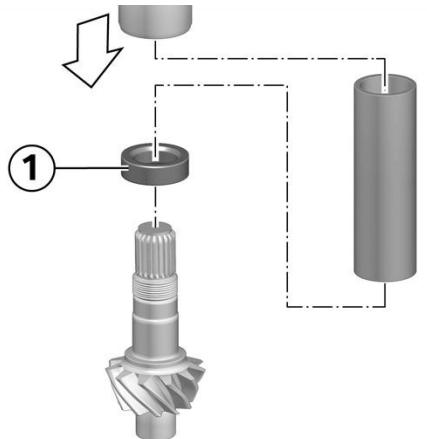
K43_11_R33014b

(-) Installing radial/thrust bearing of bevel pinion

- When undertaking the work described below, **always make sure** that the components **are installed in the correct positions**.
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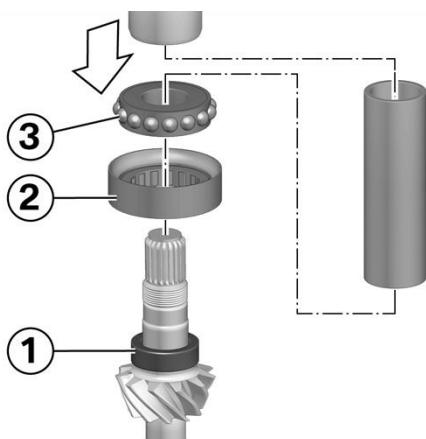
Use a suitable tool and commercially available press to install the bearing components.

- Install inner bearing race (1) until seated.



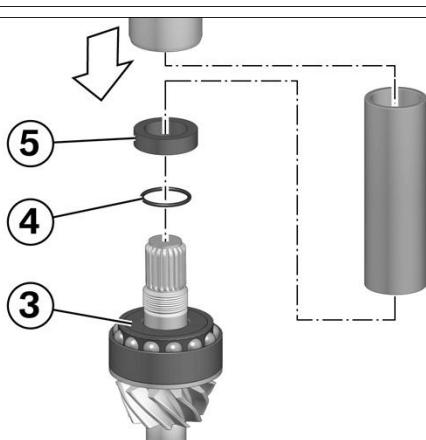
K43_11_R33018b

- Install bearing (2) and ball cage (3).
- » Ball cage (3) sits flat on inner bearing race (1).



K43_11_R33019b

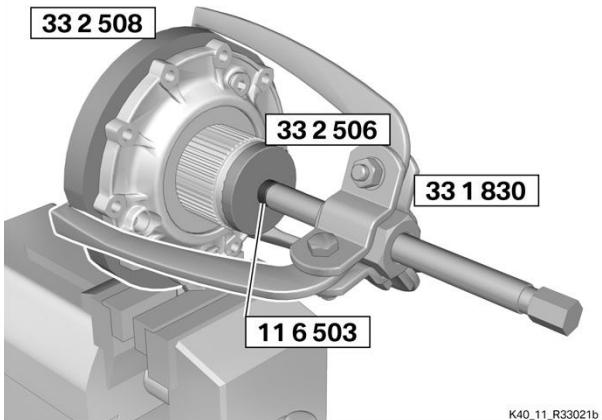
- Install O-ring (4).
- » O-ring (4) sits in the groove between bevel pinion and ball-bearing cage (3).
- Install thrust ring (5) until seated.



K27_11_R33020c

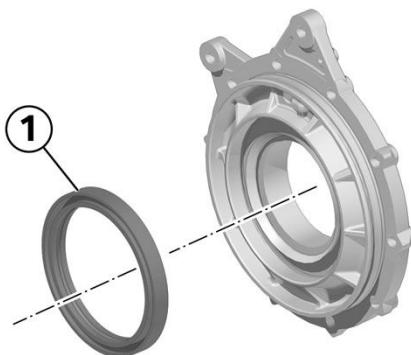
(-) Removing wheel axle from housing cover

- Install ring (No. 33 2 508).
- Clamp the housing cover in a vice fitted with **protective jaws**.
- Install puller (No. 33 1 830), washer (No. 33 2 506), and thrust piece (No. 11 6 503).
- Remove the wheel axle.



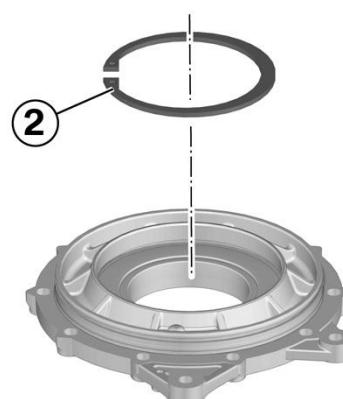
(-) Removing shaft sealing ring of wheel axle from housing cover

- Remove shaft sealing ring (1) **carefully**, using a suitable tool.



(-) Removing circlip for bearing of crown wheel from housing cover

- Remove circlip (2).



(-) Removing bearing of crown wheel from housing cover

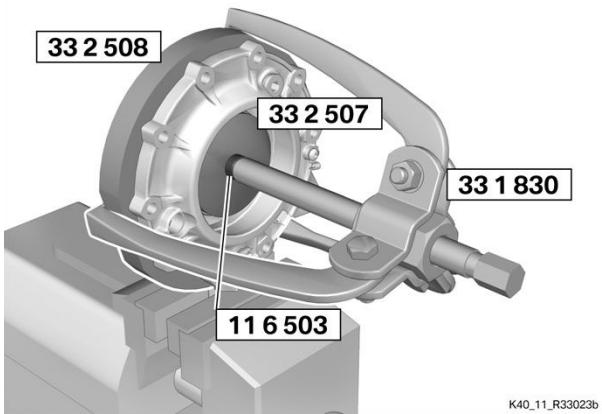
- Install ring (No. 33 2 508).
- Clamp the housing cover in a vice fitted with **protective jaws**.
-

Install puller (No. 33 1 830), washer (No. 33 2 507)(No. 11 6 503) and thrust piece and preload.

- Heat the housing cover around the bearing.

 Technical data			
Release temperature, bearing of crown wheel		120 °C	

- Remove the bearing.



(-) Install the bearing of crown wheel in housing cover

- Lay the housing cover on a clean, non-abrasive surface; take care not to damage the seats and sealing faces.

- Chill bearing (1).

- Heat the housing cover around the bearing.

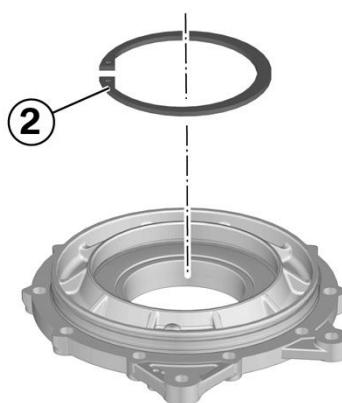
 Technical data			
Mating temperature, bearing of crown wheel		120 °C	

- Position bearing (1) square to the bore and, without allowing it to tilt, install it with washer (No. 33 2 507).

» Bearing (1) is square to the bore and fully seated.

(-) Installing circlip for bearing of crown wheel

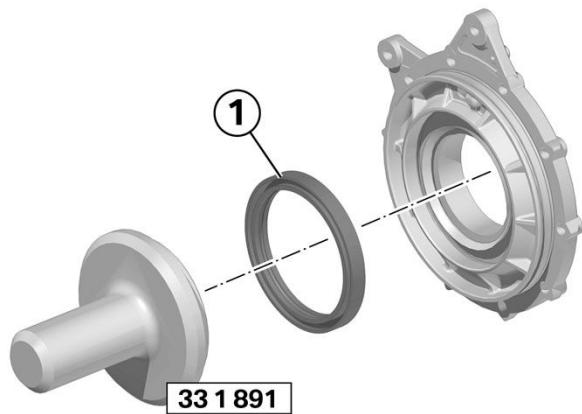
- Install circlip (2).



(-) Installing shaft sealing ring of wheel axle in housing cover

- Lubricate sealing face of shaft sealing ring.

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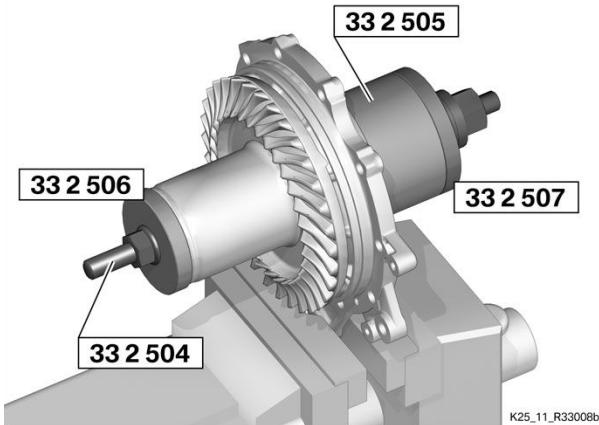


K25_HP_R33006d

**Gear oil**

BMW Synthetik OSP	83 22 2 445 460
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- Position shaft sealing ring (1) with the open side in drift (No. 33 1 891).
- Drive shaft sealing ring (1) into the housing cover until seated with drift (No. 33 1 891).



K25_11_R33009b

(-) Installing wheel axle in housing cover

- Clamp the housing cover in a vice with **protective jaws**.
- Lubricate the sealing lip of the shaft sealing ring and its friction faces where it contacts the crown wheel and inner bearing race.

⚠ WARNING

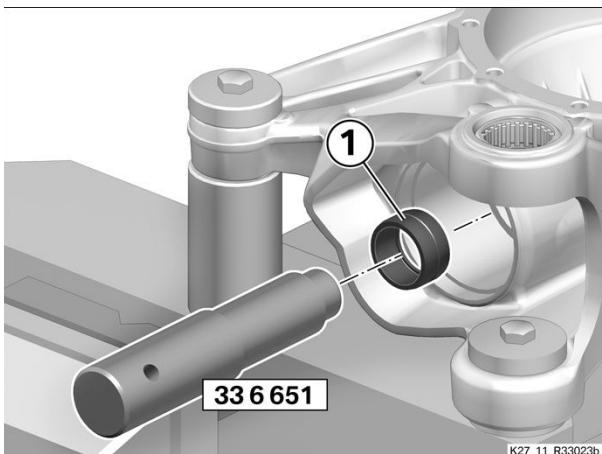
Installation of differently segmented crown wheels.

Malfunctions due to incorrect speed signals.

- Install only the crown wheel that matches the motorcycle's construction status.
- Install wheel axle, spindle and thrust nut (No. 33 2 504), washer (No. 33 2 506) and support (No. 33 2 505) with washer (No. 33 2 507).
- Install the wheel axle until seated, turning the wheel axle in the process.
- Remove the special tools.

(-) Installing bevel-pinion needle roller bearing in bevel-gear housing

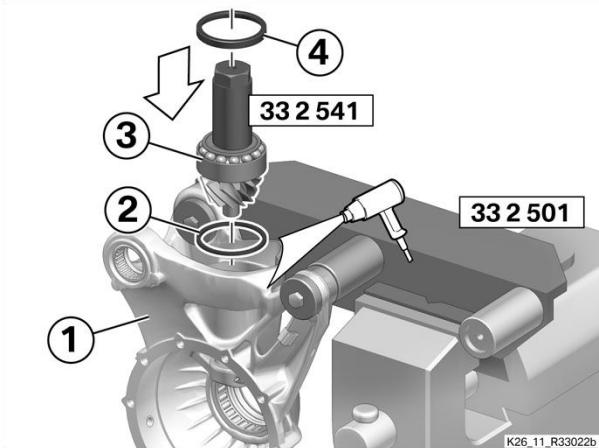
- Position bearing (1) in the housing.
- Hold drift (No. 33 6 651) in position and install bearing (1) until seated, keeping it square to the bore and without allowing it to tilt.



K27_11_R33023b

(-) Installing bevel pinion in bevel-gear housing

- Turn retaining fixture (No. 33 2 501) with housing (1) and clamp it firmly in the vice.



» Housing (1) is facing vertically down.

- Install spacing washer (2) in housing.
- Hold bearing race (4) in position on bevel pinion (3) and install threaded adapter (No. 33 2 541).
- Lightly oil the bearing seat.
- Heat the housing (1) around the bearing.



Technical data

Mating temperature for bevel pinion bearing	100 °C	
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- Install pre-assemble bevel pinion (3) rapidly and keeping it square to the bore without permitting it to tilt.

» Bevel pinion (3) and bearing race (4) are fully seated in housing (1).

(-) Installing disassembled threaded ring in bevel-gear housing

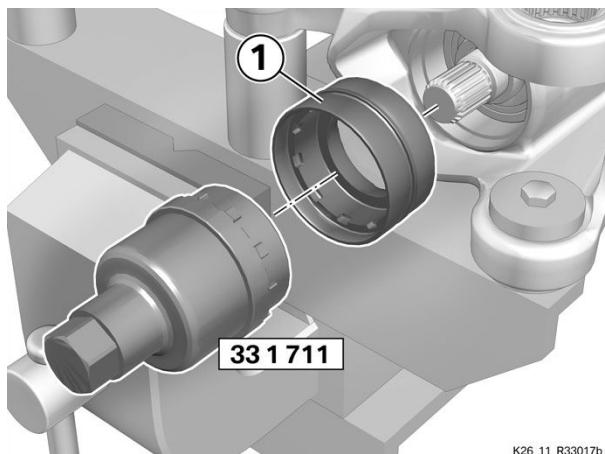
- Install **disassembled threaded ring** (1) with pin-wrench socket adapter (No. 33 1 711) and tighten.



Threaded ring

M65 x 1.5	180 Nm	
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- Remove pin-wrench socket adapter (No. 33 1 711).



K26_11_R33017b

(-) Installing housing cover of bevel gears

- Place the housing cover on the housing **without the O-ring**, turning the wheel axle until you feel the spines engage.

ATTENTION

Incorrect thickness of the shims between housing and housing cover

Accelerated wear, component damage

- When installing a new bearing in the housing cover, always be sure to ascertain the correct thickness of the shims.

- Preinstall screws with washers (2) and shims (1), **making sure installed positions are correct!**

» The open tabs (arrows) are toward the recess in the bevel-gear housing.

- Install the housing cover flush and tighten screws (2).

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 Tightening torques		
Housing cover to bevel gears		
M8 x 30	Tightening sequence: tighten in diagonally opposite sequence 30 Nm	

(-) Installing spacing ring for wheel flange

- Position spacing ring (1), noting the split pin (arrow).
- » The split pin (arrow) sits in splines of wheel axle (2).
- Installing spacer ring (1) making sure that it engages **perceptibly** and **with an audible click**.
- Install O-ring (3).

(-) Installing wheel flange

- Lay wheel flange (1) on heating plate (2) and heat it; in this process use thermometer (No. 00 1 900) to measure temperature in several recesses (arrow) **at the wheel screw connection**.

	Technical data	
Release/mating temperature	150 °C	

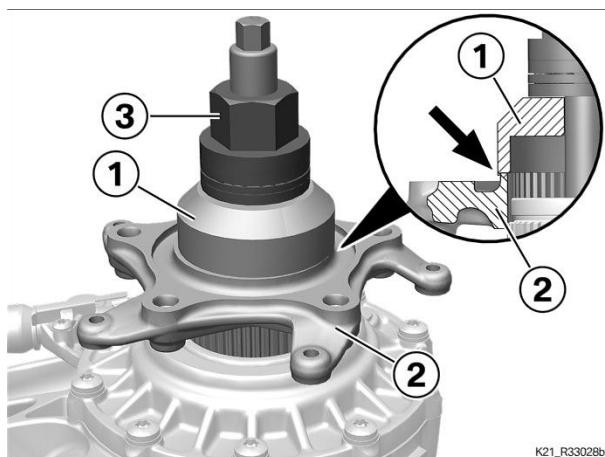
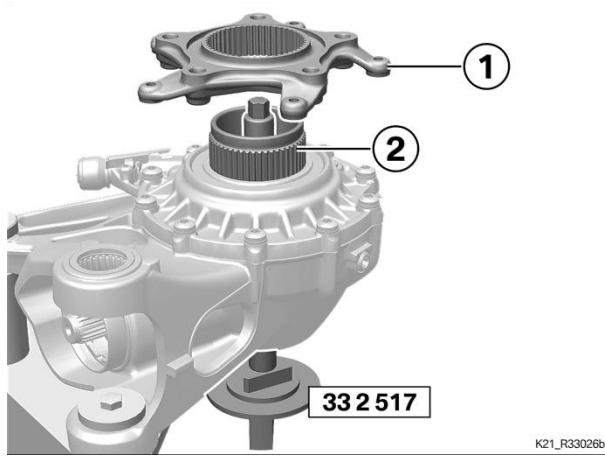
⚠ CAUTION

Working with hot components

Risk of burn injury

- Wear protective gloves.

- Hold wheel flange (1) in position, making sure that the splines of wheel flange (1) and wheel axle (2) are aligned.
- Position installation tool (No. 33 2 517).



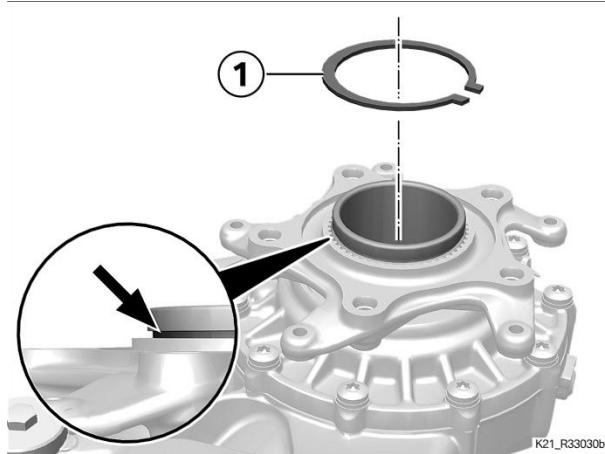
- Position thrust piece (1) in such a way that it is seated with the guide (arrow) straight and firm on wheel flange (2).
- Install thrust nut (3).
- Working quickly, install wheel flange (2) by tightening thrust nut (3) until the flange is seated; note that the process can produce a slight amount of swarf.
- Remove the special tools.

NOTICE

After installation of a new wheel flange there are slight grinding noises and the flange does not turn as freely.

This is of no significance and has to do with the bedding-in process of the primary dirt excluder seal, which is perfectly normal. The symptoms will disappear after a few kilometres.

(-) Installing retainer for wheel flange

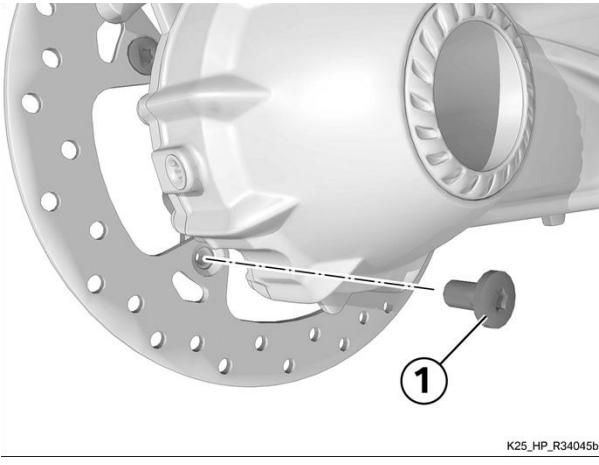


- Remove all traces of swarf from the groove (arrow).
- Install circlip (1), making sure that it **slips fully into the groove and is not under strain**.

» Circlip (1) can be turned in the groove.

(-) Installing rear brake disc

- Clean the tapped holes.
- Turn the brake disc carrier until a tapped hole is visible.
- Hold the brake disc in position, install new screw (1) and tighten until hand-tight.

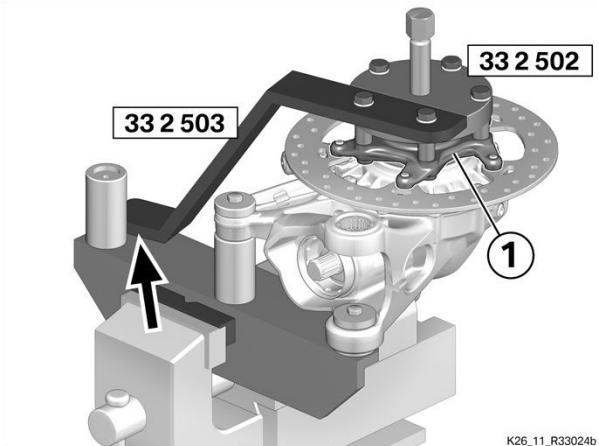


- Repeat this procedure until all the screws have been installed.
- Tighten the screws.

Tightening torques	
Brake disc to wheel carrier	
M8 x 15.5, Replace screw	Tightening sequence: tighten by stages in diagonally opposite sequence
Thread-locking compound (Micro-encapsulated)	1st tightening torque, 12 Nm
	2nd tightening torque, 30 Nm

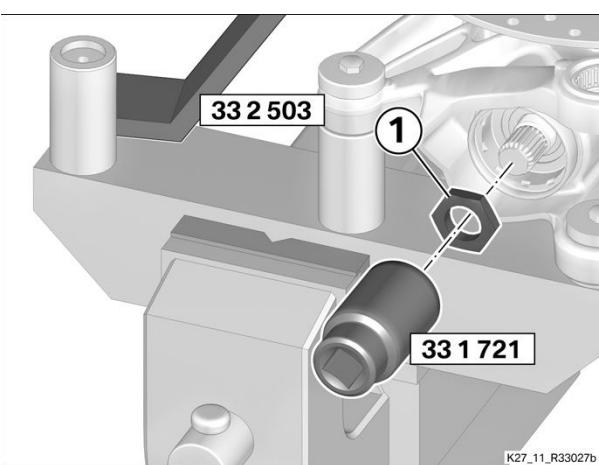
(-) Installing flange and locking device

- Position flange (No. 33 2 502) with locking device (No. 33 2 503) on wheel flange (1).
- Align locking device (No. 33 2 503) (arrow).
- Tighten flange (No. 33 2 502) with locking device (No. 33 2 503).



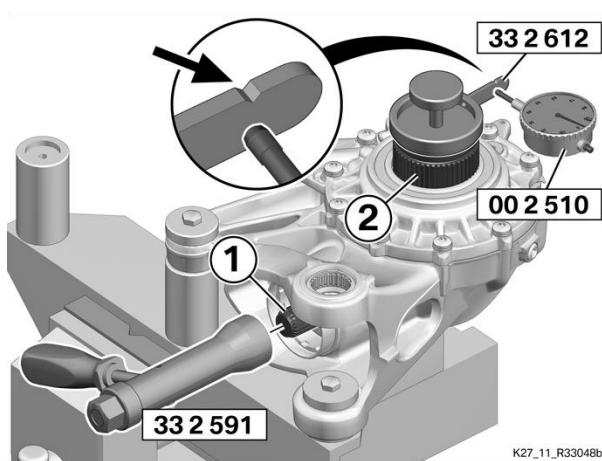
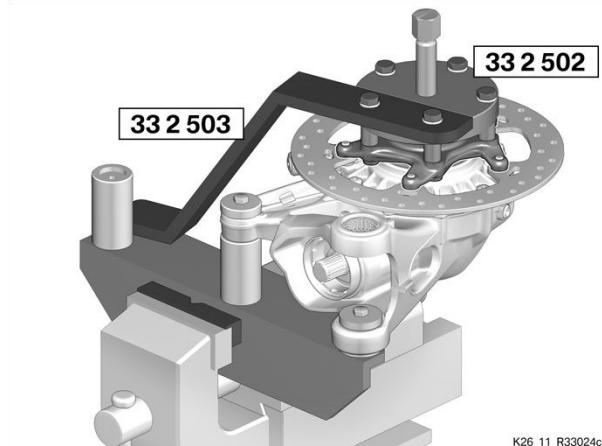
(-) Locking bevel pinion with nut

- Block locking device (No. 33 2 503) in the tightening direction.
- Tighten nut (1) with socket wrench insert (No. 33 1 721).



(-) Remove the flange and locking device

- Remove flange (No. 33 2 502) with locking device (No. 33 2 503).



(-) Adjusting backlash in bevel gears

- Turn bevel pinion (1) through several full revolutions in both directions.
- Secure measuring jig (No. 33 2 612) to wheel axle (2).
- Secure counter-holder (No. 33 2 591) to bevel pinion (1).
- Position dial gauge (No. 00 2 510) with dial-gauge holder perpendicular to the mark (arrow) on measuring jig (No. 33 2 612) in such a way that dial-gauge probe (No. 00 2 510) is in contact and slightly preloaded.
- Set dial gauge (No. 00 2 510) to "0".

Check

- Measure backlash by turning wheel axle (2) back and forth; lock bevel pinion (1) in position with counter-holder (No. 33 2 591).

☞ NOTICE

Check tooth backlash at three points 120 degrees apart. Make sure there is no oil in the bevel gears for this test.

Technical data			
Backlash of bevel gears		0.1...0.22 mm	

Result:

- Tooth backlash is out of tolerance.

Measure:

► Adjusting shims

Check

- Slacken screws (1) and housing cover (2) of bevel gears (3) until shims (4) can be removed.

☞ ATTENTION

Incorrect thickness of the shims between housing and housing cover

Accelerated wear, component damage

- When installing a new bearing in the housing cover, always be sure to ascertain the correct thickness of the shims.

- Measure the thickness of the shims with a micrometer and make a note of the thickness.

Result:

- The backlash measured in the "Checking backlash" operation is excessive.

Measure:

- Select correspondingly **thinner** shims .

Result:

- The backlash measured in the "Checking backlash" operation is insufficient.

Measure:

- Select correspondingly **thicker** shims .
- Press housing cover (2) in until flush and tighten screws (1).

	Tightening torques	
Housing cover to bevel gears		
M8 x 30	Tightening sequence: tighten in diagonally opposite sequence	30 Nm

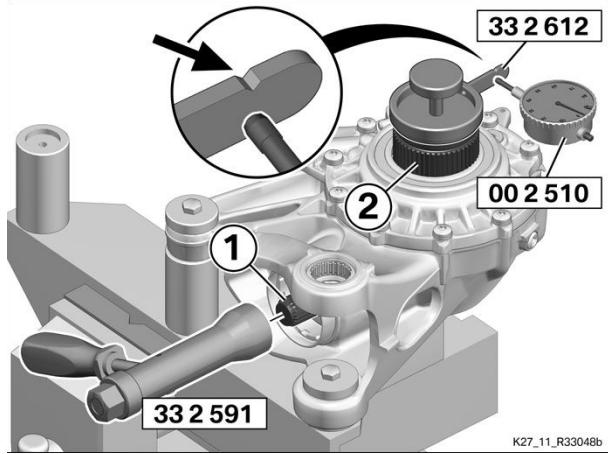
- Check tooth backlash again.

**Result:**

- Backlash to specification.

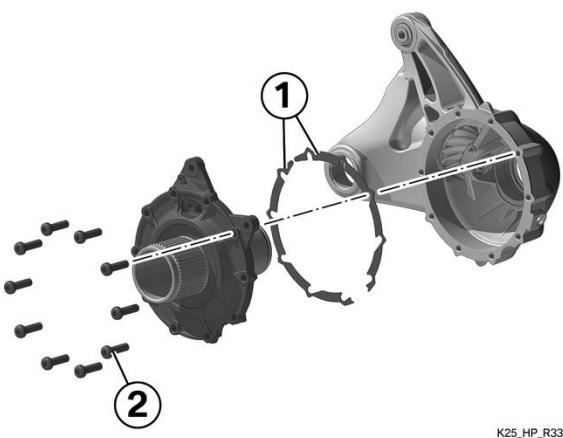
Measure:

- Remove the special tools.



K27_11_R33048b

- Remove screws (2).
- Remove the housing cover and remove shims (1).
- Remove the housing cover.



K25_HP_R33062c

(-) Checking tooth contact pattern, bevel gears

ATTENTION

Incorrect tooth backlash

Incorrect results from contact pattern test

- Adjust tooth backlash before performing contact pattern test.

- Apply a thin coat of engineer's blue to the flanks of three teeth on the crown wheel.

NOTICE

The paste for testing the contact pattern is oil-neutral and can remain on the components; it does not have to be washed off.

	Testing agent
"IRIS" contact-pattern paste, Colour: white; oil-neutral	

- Place housing cover (1) in position on the housing **without** the O-ring.
- Turn wheel axle (2), taking care **not** to smudge the ink from the tooth flanks of the crown wheel onto the bevel pinion.

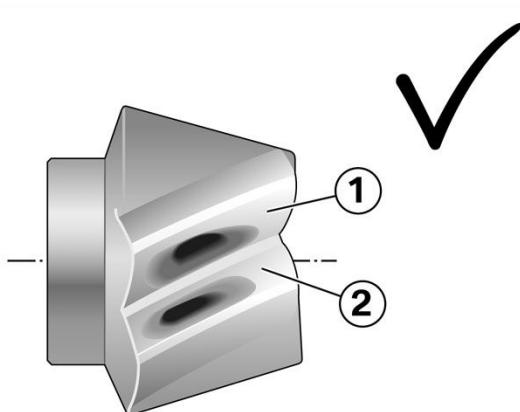
- Preinstall screws (3) and shims (4), **making sure installed positions are correct!**
 - » The tabs (arrows) face toward the **recess** in the bevel-gear housing.
- Install housing cover (1) flush and tighten screws (3).

 Tightening torques		
Housing cover to bevel gears		
M8 x 30	Tightening sequence: tighten in diagonally opposite sequence	
	30 Nm	

- Turn the bevel pinion through several full turns in both directions, using one hand to slow wheel axle (2) so as to obtain a clearly visible contact pattern with the engineer's blue.
- The **number of revolutions** must at least equal the number of teeth on the bevel pinion.

 Technical data			
Number of teeth in bevel gears (gear ratio)		32:11	

- Remove screws with washers (1).
- Remove housing cover (2) and remove shims (3).
- Remove housing cover (2) with wheel axle.



- Visually inspect the bevel pinion.

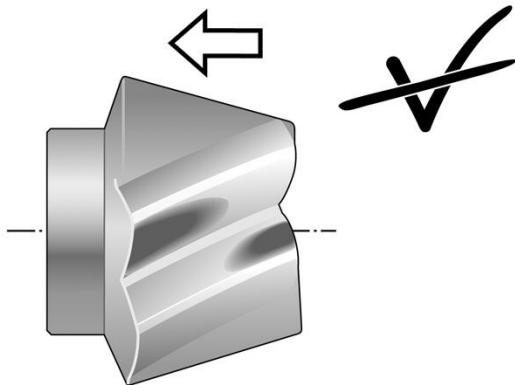
Check

Result:

- On the front flank (1), the unloaded contact pattern is in the middle and closer to the large diameter on the rear flank (2).

Measure:

- None, tooth contact pattern is good, setting is correct (ideal pattern).



K43_11_R33029b

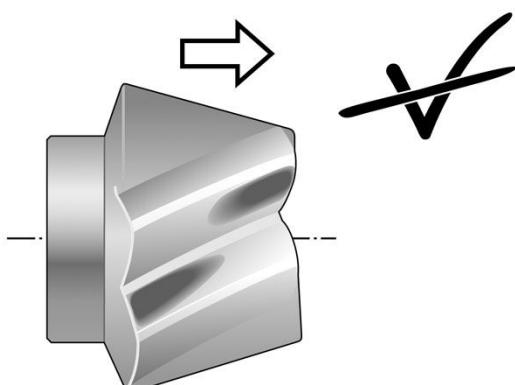
Check

Result:

- Contact pattern is out of position.

Measure:

- The bevel pinion has to be repositioned (arrow).
- Select a **thicker** shim.
=> 33 74 525, Adjusting tooth contact pattern (after test of contact pattern)
(Billed as a separate item)
- Repeat the test.



K43_11_R33028b

Check

Result:

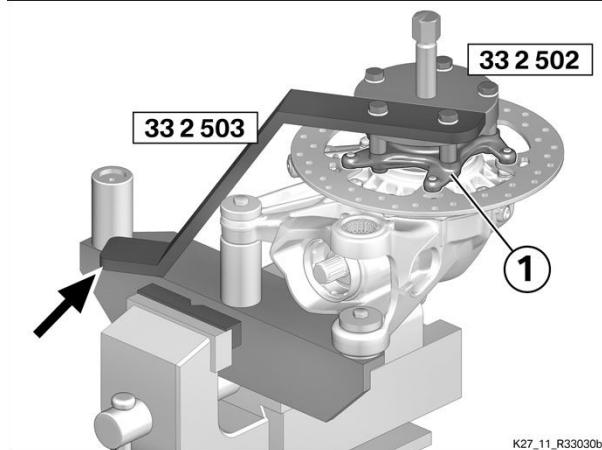
- Contact pattern is out of position.

Measure:

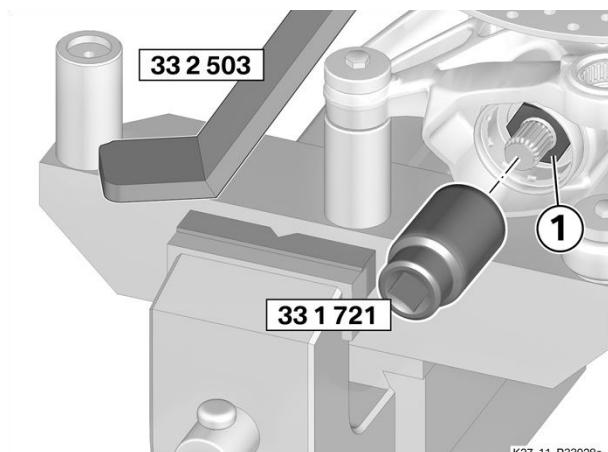
- The bevel pinion has to be repositioned (arrow).
- Select a **thinner** shim.

=> 33 74 525, Adjusting tooth contact pattern (after test of contact pattern)
(Billed as a separate item)

- Repeat the test.

(-) Installing flange and locking device

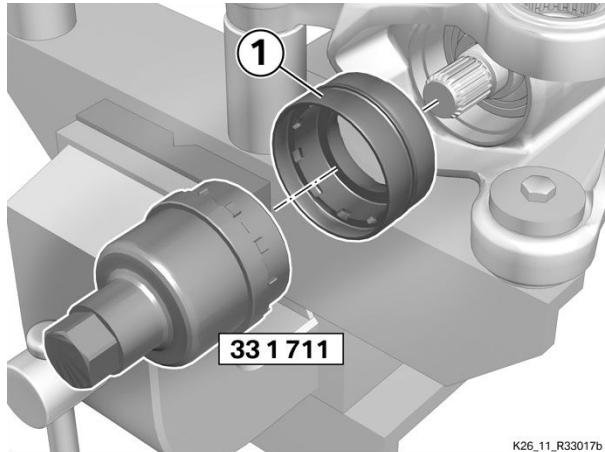
- Position flange (No. 33 2 502) with locking device (No. 33 2 503) on wheel flange (1).
- Align locking device (No. 33 2 503) in the release direction (arrow).
- Tighten flange (No. 33 2 502) with locking device (No. 33 2 503).

**(-) Remove the nut from bevel pinion**

- Block locking device (No. 33 2 503) so that it cannot turn in the release direction.
- Remove nut (1) with socket wrench insert (No. 33 1 721).

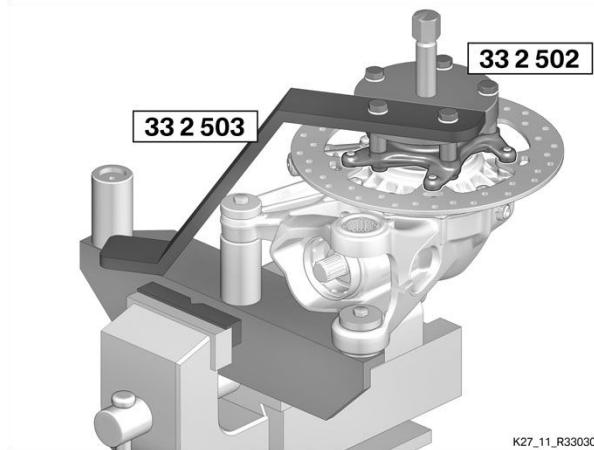
(-) Removing disassembled threaded ring from bevel pinion

- Remove disassembled threaded ring (1) with pin wrench socket adapter (No. 33 1 711).



(-) Remove the flange and locking device

- Remove flange (No. 33 2 502) with locking device (No. 33 2 503).



(-) Removing housing cover for bevel gears

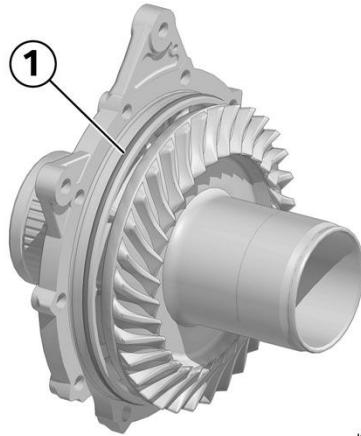
NOTICE

If the wheel axle is removed from the bevel-gear housing, install a new shaft sealing ring in the housing.

- Remove screws (1).
- Remove housing cover (2) and remove shims (3).
- Remove housing cover (2) with wheel axle.

(-) Installing O-ring in housing cover for bevel gears

- Install new O-ring (1).



K25_HP_R33034c

(-) Installing housing cover of bevel gears

- Place the housing cover on the housing, turning the wheel axle until you feel the spines engage.

ATTENTION

Incorrect thickness of the shims between housing and housing cover

Accelerated wear, component damage

- When installing a new bearing in the housing cover, always be sure to ascertain the correct thickness of the shims.

- Preinstall screws (2) and shims (1), **making sure installed positions are correct!**

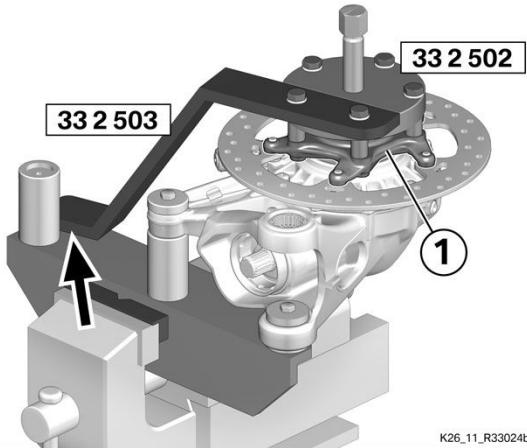
» The open tabs (arrows) are toward the recess in the bevel-gear housing.

- Install the housing cover flush and tighten screws (2).

Tightening torques		
Housing cover to bevel gears		
M8 x 30	Tightening sequence: tighten in diagonally opposite sequence	
	30 Nm	

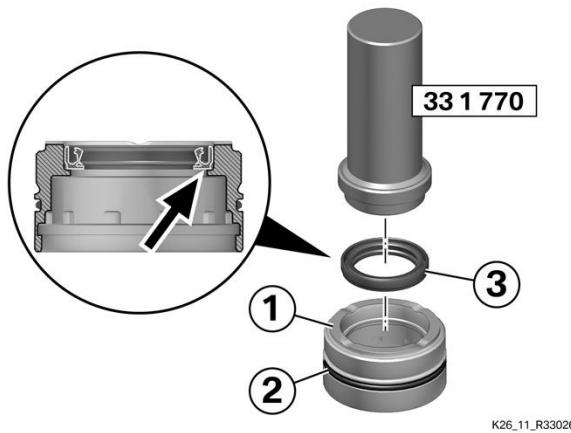
(-) Installing flange and locking device

- Position flange (No. 33 2 502) with locking device (No. 33 2 503) on wheel flange (1).
- Align locking device (No. 33 2 503) (arrow).
- Tighten flange (No. 33 2 502) with locking device (No. 33 2 503).



(-) Assembling threaded ring for bevel pinion

- Position **new shaft sealing ring** (3) on threaded ring (1) with the closed side down (**arrow**).
- Drive in shaft sealing ring (3) until seated, using drift (No. 33 1 770).
- Install new O-ring** (2).



(-) Installing threaded ring on bevel pinion

- Seat sliding sleeve (No. 33 2 551) on bevel pinion shaft (1).
- Lightly oil sealing lip of shaft sealing ring (2).



Gear oil

BMW Synthetik OSP	83 22 2 445 460
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- Install threaded ring (3) and tighten with pin-wrench socket adapter (No. 33 1 711).



Tightening torques

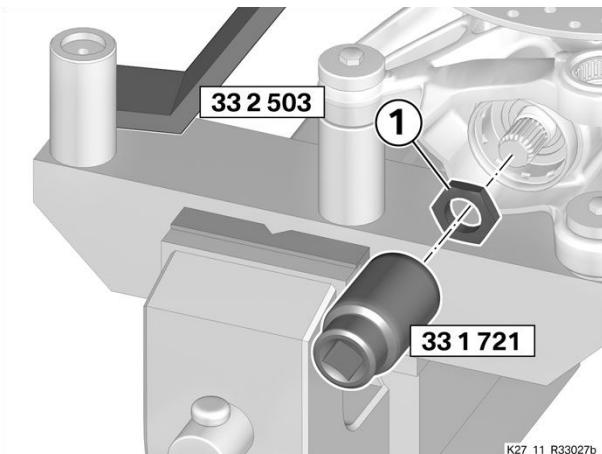
Threaded ring

M65 x 1.5	180 Nm	
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- Remove pin-wrench socket adapter (No. 33 1 711) and sliding sleeve (No. 33 2 551).

(-) Install the nut on bevel pinion

- Block locking device (No. 33 2 503) in the tightening direction.



- Tighten nut (1) with socket wrench insert (No. 33 1 721).

	Tightening torques	
Hex nut to bevel pinion		
Clean the threads, M24 x 1.5	200 Nm	
Thread-locking compound (Loctite 2701, High strength)		

Follow-up work

Remove the flange and locking device

Removing bevel gears from retaining fixture

Installing shaft sealing ring of wheel axle in housing

Installing cover and wheel axle circlip.

Filling bevel gears with oil

Installing plug